--This application is a Divisional Application of U.S. Patent Application Serial No. 09/613,947, filed July 11, 2000, incorporated herein by reference, which is a Divisional Application of 09/119,256, filed July 20, 1998, now U.S. Patent No. 6,171,541, which claims benefit from Provisional Application Serial No. 60/080,085, filed March 31, 1998.--.

IN THE CLAIMS:

Kindly cancel Claims 1-98 without prejudice or disclaimer of the rejected matter recited therein.

Kindly add Claims 99-166.

99. An apparatus for the reduction of heat in a molded article, comprising;

a takeoff unit configured to receive and retain the molded article;

a means for transmitting a cooling medium to an internal surface of the molded article; and

a stripper means operative to selectively remove the molded article from said take-off unit.

100. The apparatus of claim 99, wherein said take off unit comprises a tube configured to receive and retain the molded article.

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101. The apparatus of claim 100, wherein said tube further comprises a second cooling means operative to remove heat from an exterior surface of the molded artcle.

102. The apparatus of claim 101, wherein said tube is in communication with a vacuum for selectable retention of the molded article.

103. The apparatus of claim 99, wherein said cooling means comprises a pin adapted to transmit said cooling medium to a plurality of locations along an interior surface of the molded article.

104. The apparatus of claim 99, wherein said pin further comprises a longitudinal passageway for the transmission of said cooling medium to a portion of the molded artcle selected from the group consisting of a sprue portion, neck portion and threaded portion.

105. The apparatus of claim 99, wherein said cooling medium is one selected from the group consisting of a liquid and a gas.

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106. An apparatus for the temperature conditioning of a molded artcle comprising:

a take-off means adapted to receive and retain the molded artcle;

an elongated cooling means adapted to be inserted into an open end of the molded artcle;

a central passageway located in said cooling means for the transmission of a cooling medium; and

a radial passageway in fluid communication with said central passageway, said radial passageway configured to transmit the cooling medium to a surface of the molded article.

107. The apparatus of claim 106, wherein said central passageway extends co-axially the entire length of said cooling means for the transmission of said cooling medium to

a portion of said molded article adjacent a nub on said molded article.

a2 108. The apparatus of claim 106, wherein the molded article comprises a PET preform.

109. The apparatus of claim 106, wherein said cooling medium is directed to a plurality of locations of an inside surface of the molded article.

110. The apparatus of claim 106, wherein said take-off means comprises an elongated tube.

111. The apparatus of claim 110, wherein said elongated tube is coupled to a vacuum means for selectable retention of the molded article.

112. The apparatus of claim 110, wherein said elongated tube is substantially cylindrical and a second cooling means is provided in said tube to remove heat energy from the molded article.

113. The apparatus of claim 112, wherein said second cooling means is comprised of a passageway configured to transmit a

cooling medium through said tube and around the molded article.

a 2 114. Apparatus for cooling a molded article made in an injection mold formed from mold halves, the molded article having a gate portion, the apparatus comprising:

an end of arm tool having at least one holder, the end of arm tool operational, in use, between a first position between the mold halves where it receives the molded article into a respective one of the at least one holder and a second position outside of the mold , the molded article located, in use, into the respective one of the at least one holder at a time when the molded article retains an amount of heat;

a cooling pin on a frame located adjacent the second position, the cooling pin having a tip and the frame arranged, in use, to move relative to the end of arm tool to cause insertion of the tip of the cooling pin into the molded article when the end of arm tool reaches the second position;

said cooling pin has an internal channel terminating at the tip that, upon insertion into the molded article by operation of the frame, is within the molded article but spaced away from the gate portion and wherein the cooling pin, in use, is connectable to a cooling fluid delivery system arranged to force gaseous cooling fluid along the internal channel to cause expulsion of the gaseous cooling

fluid from the tip mostly in a direction of the gate portion to accentuate cooling within at least a region of the molded article surrounding the gate portion; and

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the frame is distanced, during the expulsion of the gaseous cooling fluid from the tip, from the end-or-arm tool such as to define, in use, an open system by ensuring formation of a space between a region of an external surface of the cooling pin and an open end of the molded article both located, in use, within the respective holder and positioned adjacent said region of the external surface of the cooling pin, the space allowing venting of gaseous cooling fluid from an interior of the molded article to an ambient environment.

115. Apparatus according to claim 114, wherein the frame positions the cooling pin within the molded article such that:

i) the tip is displaced a first distance (d) from the gate portion of the molded article;

ii) a sidewall of said cooling pin is located a second distance (D) from internal sidewalls of the molded article; and a ratio of first distance to the second distance (d: D) is in the range of about 1:1 to about 10:1.

116. Apparatus according to claim 115, wherein the gaseous cooling fluid is cooled pressurized air that is blown along the internal channel.

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117. Apparatus according to claim 116, wherein the holder is cooled to provide cooling to exterior portions of the molded article.

118. Apparatus according to claim 117, further including a valve for supplying regulated amounts of gaseous cooling fluid to the cooling pin.

119. Apparatus according to claim 118, wherein the tip has one of a divergent nozzle construction and a straight-walled nozzle construction, wherein the internal channel and tip, when located within the molded article, act to focus the gaseous cooling fluid towards a region principally surrounding a gate portion.

120. Apparatus according to claim 119, wherein the cooling pin has one of:

i) a varying diameter along its length;

ii) lateral fluid outlets or radial conduits in the sides of the cooling pin, the lateral outlets or radial conduits coupled to the internal channel and arranged to direct

cooling fluid to at least one of a neck portion and a body portion of the molded article;

iii) grooves along an exterior surface of the cooling pin ;

iv) ribs spaced about the periphery of the cooling pin, the ribs protruding from the cooling pin to reduce, in use, over a length of each rib a dimensional separation of an exterior surface of the cooling pin to the internal wall of the molded article; and

v) a plurality of contact elements along an exterior surface of the cooling pin.

121. Apparatus according to claim 120, wherein the moveable frame supports fewer cooling pins than there are holders on the end of arm tool, whereby, in use, only certain ones of molded articles in respective holders are cooled in any one operational stage.

122. Apparatus according to claim 121, the apparatus arranged to apply cooling fluid to the gate region of the molded article at a time when the amount of heat retained in the molded article has the potential to induce crystallization within the molded article and such that application of the cooling fluid to the gate region substantially prevents crystallization in at least the gate region.

123. Apparatus for cooling a molded article made in an injection mold formed from mold halves, the molded article having a first region at a relatively high heat and an adjacent region at a relatively lower heat, the apparatus comprising:

an end of arm tool having at least one holder, the end of arm tool operational, in use, between a first position between the mold halves where it receives the molded article into a respective one of the at least one holder and a second position outside of the mold, the molded article located, in use, into the respective one of the at least one holder at a time when the molded article retains an amount of heat;

a cooling pin on a frame located adjacent the second position, the cooling pin having a tip and the frame arranged, in use, to move relative to the end of arm tool to cause insertion of the tip of the cooling pin into the molded article after the end of arm tool reaches the second position, the cooling pin having an internal channel terminating at the tip that, upon insertion into the molded article by relative movement of the frame and the end of arm tool, is within the molded article but spaced away from the first region and wherein the cooling pin, in use, is connectable to a cooling fluid delivery system arranged to force gaseous cooling fluid along the internal channel to

cause expulsion of the gaseous cooling fluid from the tip mostly in a direction of the first region to accentuate cooling within at least the first region; and

the frame is positioned, during the expulsion of the gaseous cooling fluid from the tip, with respect to the end-or-arm tool such as to define, in use, an open system having a passageway allowing venting of gaseous cooling fluid from an interior of the molded article to an ambient environment.

124. Apparatus according to claim 123, wherein the apparatus is operational, during the expulsion of gaseous cooling fluid from the tip, to distance the frame from the end of arm tool, and the passageway of the open system is produced by formation of a space between a region of an external surface of the cooling pin and an open end of the molded article both located, in use, within the respective holder and positioned adjacent said region of the external surface of the cooling pin.

125. Apparatus according to claim 123, wherein the apparatus is arranged to introduce the tip of the cooling pin into the preform to a depth that allows the coolant to reach and cool an internal dome portion of a preform.

126. Apparatus according to claim 125, wherein the frame positions the cooling pin within the molded article such that:

i) the tip is displaced a first distance (d) from the first region of the molded article;

ii) a sidewall of said cooling pin is located a second distance (D) from internal sidewalls of the molded article ; and a ratio of first distance to the second distance (d: D) is in the range of about 1:1 to about 10:1.

127. Apparatus according to claim 126, wherein the gaseous cooling fluid is cooled pressurized air that is blown along the internal channel.

128. Apparatus according to claim 127, wherein the holder is coupled to a heat sink arranged to dissipate heat from the holder thereby to cool exterior portions of the molded article.

129. Apparatus according to claim 128, further including a valve for supplying regulated amounts of gaseous cooling fluid to the cooling pin.

130. Apparatus according to claim 129, wherein the tip has one of a divergent nozzle construction and a straight-walled

nozzle construction, wherein the internal channel and tip, when located within the molded article, act to focus the gaseous cooling fluid towards a region principally surrounding a first region.

131. Apparatus according to claim 130, wherein the cooling pin has one of:

i) a varying diameter along its length;

ii) lateral fluid outlets or radial conduits in the sides of the cooling pin, the lateral outlets or radial conduits coupled to the internal channel and arranged to direct cooling fluid to at least one of a neck portion and a body portion of the molded article;

iii) grooves along an exterior surface of the cooling pin ;

iv) ribs spaced about the periphery of the cooling pin, the ribs protruding from the cooling pin to reduce, in use, over a length of each rib a dimensional separation of an exterior surface of the cooling pin to the internal wall of the molded article; and

v) a plurality of contact elements along an exterior surface of the cooling pin.

132. Apparatus according to claim 131, wherein the moveable frame supports fewer cooling pins than there are holders on the end of arm tool, whereby, in use, only certain ones of

molded articles in respective holders are cooled in any one operational stage.

133. Apparatus according to claim 132, the apparatus arranged to apply cooling fluid to the first region of the molded article at a time when the amount of heat retained in the molded article has the potential to induce crystallization within the molded article and such that application of the cooling fluid to the first region substantially prevents crystallization in at least the first region.

134. Apparatus for cooling a plurality of molded articles, comprising:

a takeout plate, having a plurality of cooled cavities, for holding the plurality of plastic preforms after they have been removed from a mold cavity device, said plurality of cooled cavities being configured to conductively cool respective exterior surfaces of the plurality of molded articles; and

a cooling plate having a plurality of cooling pins which are configured to fit inside the plurality of molded articles and to convectively cool respective interior surfaces of the plurality of molded articles.

135. Apparatus according to Claim 134, wherein said plurality of cooling pins are configured to convectively cool the respective interior surfaces of the plurality of molded articles at a time when said plurality of cooled cavities being are conductively cooling the respective exterior surfaces of the plurality of molded articles.

136. Apparatus according to Claim 134, wherein each said cooling pin is configured to provide an annular cooling fluid flow over the interior surface of the respective molded article.

137. Apparatus according to Claim 134, wherein each said cooling pin includes:

a cooling fluid passageway on an interior thereof; and

a cooling fluid exit at a distal end thereof to provide cooling fluid flow to a gate area of the respective molded article.

138. Apparatus according to Claim 134, wherein said takeout plate is movable with respect to the mold cavity device.

139. Apparatus according to Claim 134, wherein said cooling plate is movable with respect to said takeout plate.

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140. Apparatus according to Claim 134, wherein said takeout plate comprises a two-dimensional array of cooling cavities.

141. Apparatus according to Claim 134, wherein said takeout plate includes a plurality of cooling fluid passageways disposed adjacent each said cooling cavity.

142. Apparatus according to Claim 134, wherein each said cooling pin is configured to not contact the interior surface of said respective molded article.

143. Apparatus according to Claim 134, wherein each said cooling cavity is configured to contact substantially the entire outer surface of said respective molded article.

144. Apparatus according to Claim 134, wherein each said cooling pin has an interior cooling fluid exit channel configured to permit cooling fluid to exit from an

interior of said respective molded article through an interior of said each cooling pin.

145. Apparatus according to Claim 134, further comprising cooling fluid supply structure configured to provide cooling fluid to each said cooling pin to cause cooling of a tip of said respective molded article at a rate which prevents substantial crystallinity formation in said tip.

146. Apparatus according to Claim 134, wherein each said cooling pin has a single cooling fluid exit disposed to provide cooling fluid to an interior surface of a sprue gate portion of the respective molded article.

147. Apparatus for cooling a plurality of molded articles, comprising:

exterior cooling means for cooling exterior surfaces of the plurality of molded articles after they have been removed from a mold cavity means, said exterior cooling means including a two-dimensional array of cooling cavity means, each cooling cavity means having a plurality of cooling fluid passageways configured to cool an exterior surface of the respective molded article, said exterior

cooling means being spaced apart from the mold cavity means; and

interior cooling means for cooling interior surfaces of the plurality of molded articles after they have been removed from a mold cavity means, said interior cooling means including a two-dimensional array of cooling cavity pin means, each cooling pin means having (i) interior cooling fluid passageway means for supplying cooling fluid to a distal end of said each cooling pin means, and (ii) cooling fluid exit means, in fluid communication with said cooling fluid passageway means, for directing cooling fluid at an interior surface of a sprue gate portion of the respective molded article, said interior cooling means for supplying the cooling fluid to said cooling fluid exit means at a time when said exterior cooling means is cooling the exterior surface of the respective molded article, said interior cooling means being spaced apart from the mold cavity means and a mold core means.

148. Apparatus according to Claim 147, wherein said plurality of cooling cavity means are for conductively cooling respective exterior surfaces of the plurality of molded articles.

149. Apparatus according to Claim 148, wherein said plurality of cooling pin means are for convectively cooling respective interior surfaces of the plurality of molded articles.

150. Apparatus according to Claim 149, wherein each said cooling pin means is for providing an annular cooling fluid flow over the interior surface of the respective molded article.

151. Apparatus according to Claim 150, wherein said interior cooling means is movable with respect to the mold cavity means.

152. Apparatus according to Claim 151, wherein said exterior cooling means is movable with respect to said interior cooling means.

153. Apparatus according to Claim 147, wherein each said cooling pin means is for not contacting the interior surface of said respective molded article.

154. Apparatus according to Claim 147, wherein each said cooling cavity means is for contacting

substantially the entire outer surface of said respective molded article.

155. Apparatus according to Claim 134, wherein each said cooling pin means has an interior cooling fluid exit channel means for permitting cooling fluid to exit from an interior of said respective molded article through an interior of said each cooling pin means.

156. Apparatus according to Claim 147, further comprising cooling fluid supply means for providing cooling fluid to each said cooling pin means to cause cooling of a tip of said respective molded article at a rate which prevents substantial crystallinity formation in said tip.

157. Apparatus for cooling a plurality of plastic preforms, comprising:

exterior cooling structure configured to cool exterior surfaces of the plurality of plastic preforms after they have been removed from a mold cavity structure, said exterior cooling structure including a two-dimensional array of cooling cavities, each cooling cavity having a plurality of cooling fluid passageways configured to cool an exterior surface of the respective plastic preform, said exterior

cooling structure being spaced apart from the mold cavity means; and

interior cooling structure configured to cool interior surfaces of the plurality of plastic preforms after they have been removed from a mold cavity structure, said interior cooling structure including a two-dimensional array of cooling cavity pins, each cooling pin having (i) an interior cooling fluid passageway configured to supply cooling fluid to a distal end of said each cooling pin, and (ii) a cooling fluid exit, in fluid communication with said cooling fluid passageway, for directing cooling fluid at an interior surface of a tip portion of the respective plastic preforms, said interior cooling structure configured to supply the cooling fluid to said cooling fluid exit at a time when said exterior cooling structure is cooling the exterior surface of the respective plastic preforms, said interior cooling structure being spaced apart from the mold cavity structure and a mold core structure.

158. Apparatus according to Claim 157, wherein said plurality of cooling cavities are configured to conductively cool respective exterior surfaces of the plurality of plastic preforms.

159. Apparatus according to Claim 158, wherein said plurality of cooling pins are configured to convectively cool respective interior surfaces of the plurality of plastic preforms.

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160. Apparatus according to Claim 159, wherein each said cooling pin is configured to provide an annular cooling fluid flow over the interior surface of the respective plastic preforms.

161. Apparatus according to Claim 160, wherein said interior cooling structure is configured to be movable with respect to the mold cavity means.

162. Apparatus according to Claim 161, wherein said exterior cooling structure is configured to be movable with respect to said interior cooling structure.

163. Apparatus according to Claim 157, wherein each said cooling pin is configured to not contact the interior surface of said respective plastic preforms.

164. Apparatus according to Claim 157, wherein each said cooling cavity is configured to contact